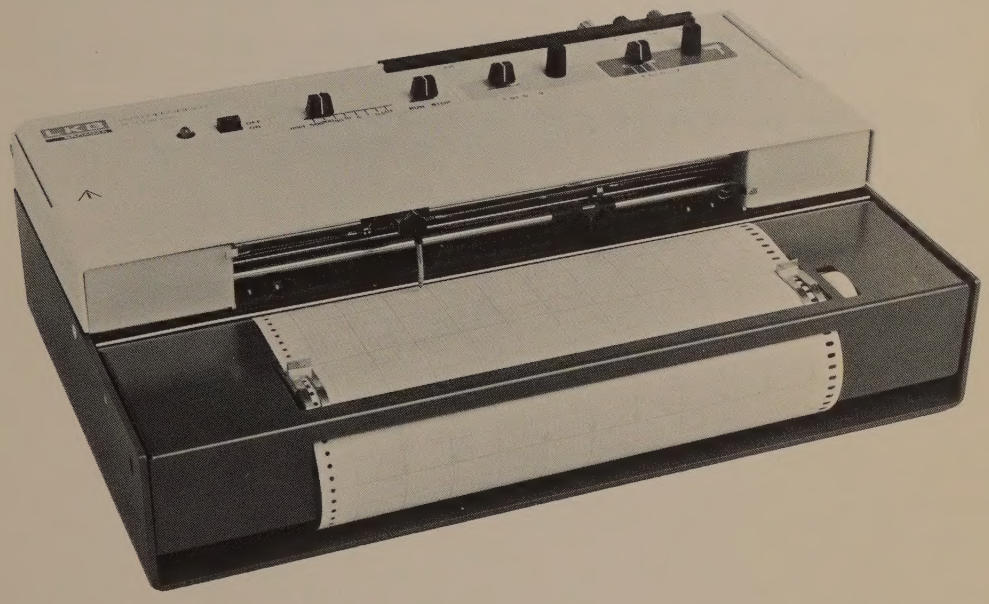
Instruction Manual

LKB
THE INCENTIVE GROUP

LKB 2210
Potentiometric Recorder



2210-061/062
2210-071/072
90 01 8236 2210-000-IME
0321-260 (8411)

PLEASE READ THIS MANUAL CAREFULLY BEFORE ATTEMPTING TO USE THE INSTRUMENT

Foreword

This manual describes the LKB 2210 Potentiometric Recorder. The first sections deal with the physical description, installation and usage of the instrument and contain all the information needed to operate the recorders.

The last sections deal with the technical specifications, volume calibration of x-axis and the description of accessories.

If you have any comments on this manual, we will be pleased to receive them at:

LKB-Produkter AB
Box 305
S-161 26 Bromma
Sweden

Since product development and improvement is a continuous process, LKB reserves the right to make changes in the specification without notice.

Warranty and Liability

LKB-Produkter AB guarantee that their delivered instrument has been thoroughly tested to ensure that it meets its published specification.

The warranty included in the conditions of delivery is valid only if the instrument has been used according to the instructions supplied by LKB-Produkter AB.

LKB-Produkter AB can accept no liability for loss or damage however, caused, arising from the faulty or incorrect use of the instrument.

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Introduction

A laboratory recorder must be able to meet a variety of demands. It must cover a wide range of paper chart speeds. It is expected to have a fast and accurate response with a fine pen trace to take advantage of the resolution and it has to yield satisfactory performance under varying temperature conditions.

The LKB 2210 Potentiometric recorders not only provide these basic instrument functions but offer additional advantages for the modern chromatographer:

— built-in event marker
— volume-controlled chart speed
— compact design
— power cut-off function for servo-motor protection
— compatibility with other LKB instrumentation

Model descriptions

This manual is intended for the following LKB 2210 recorders:

2210-061
1-channel recorder with 2 input ranges (0.1V and 1V) and 8 chart speeds (0.1 mm/min - 500mm/min). Built-in event marker (by pen displacement), external chart speed control and chart drive stop. For 115V/50/60Hz.

2210-062
Same as 2210-061 except for 220V/50/60Hz.

2210-071
2-channel recorder with 2 input ranges per channel (0,1V and 1V) and 8 chart speeds (0,1mm/min - 500mm/min). Built-in event marker (by pen displacement), external chart speed control and drive stop. For 115 V/50/60Hz.

2210-072
Same as 2210-071 except for 220V/50/60Hz.

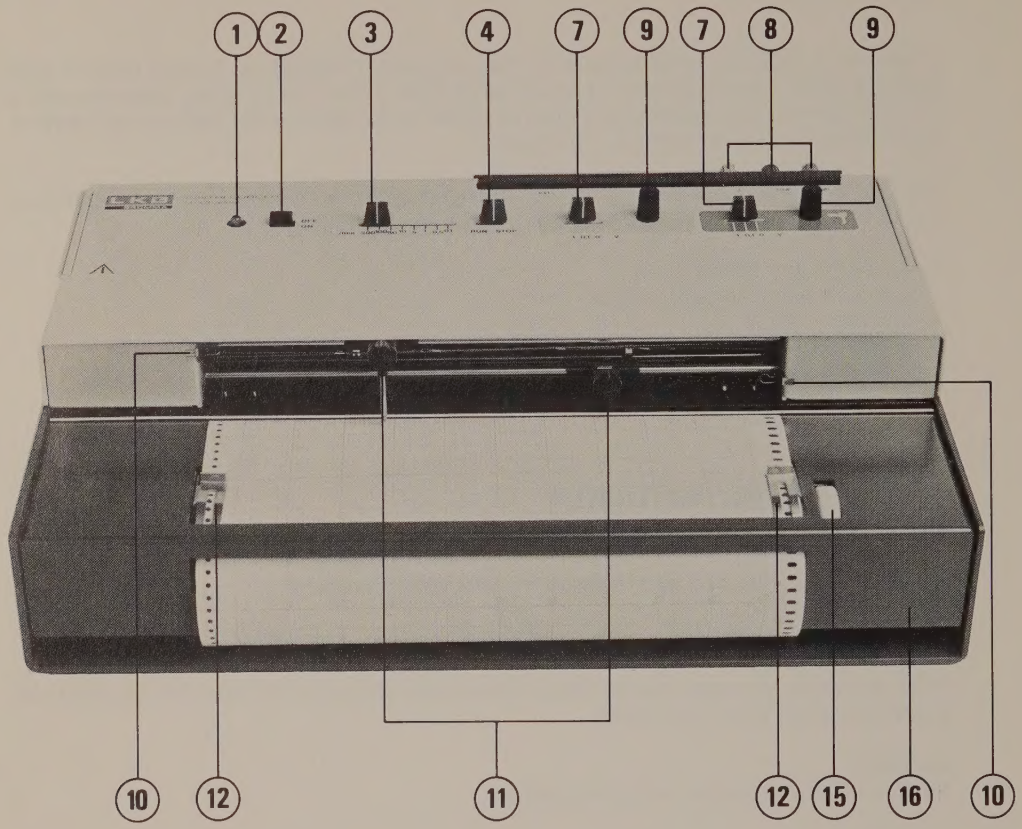

1
2
3
4
7
9
7
8
9
10
12
11
12
15
16
10

Fig. 1

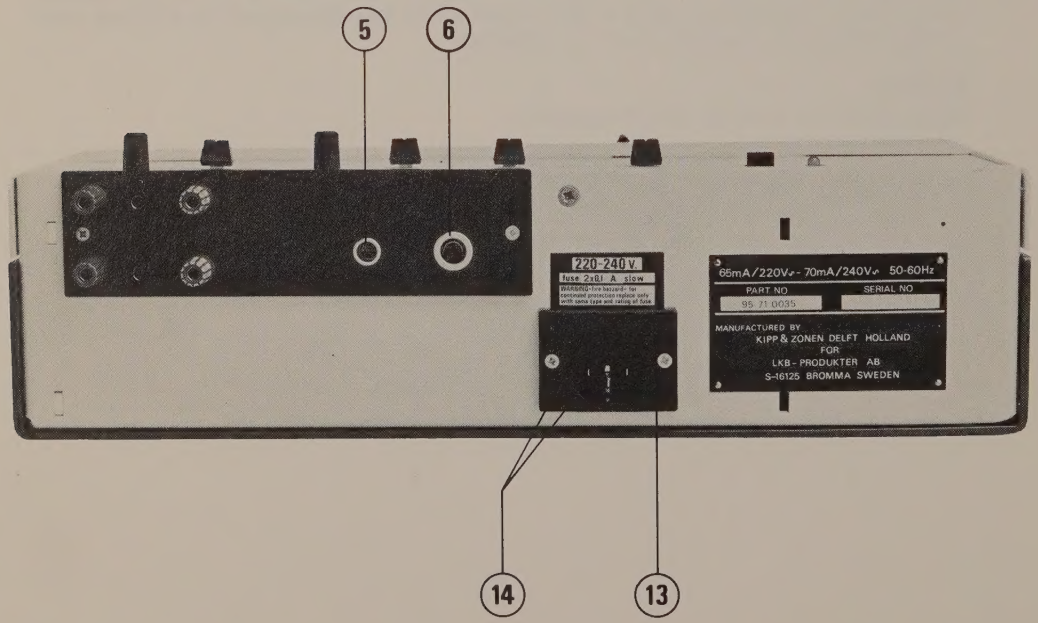

5
6
220-240 V
fuse 2x0.1 A slow
65mA/220V~ - 70mA/240V~ 50-60Hz
PART NO
95 21 0035
SERIAL NO
MANUFACTURED BY
KIPP & ZONEN DELFT HOLLAND
FOR
LKB - PRODUKTER AB
S-16125 BROMMA SWEDEN
14
13

Fig. 2

Physical description

Operating controls - see Figs. 1 and 2.

1. Mains lamp
2. Mains switch
3. Chart speed selector
4. Run/Stop selector
5. External control connector (Le)
6. External control connector (Fi)
7. Range selector
8. Input terminals
9. Zero adjustment
10. Pen lift lever
11. Recorder pen
12. Chart guides
13. Mains input connector
14. Fuse holders
15. Manual chart drive knob
16. Cassette

Installation

When unpacking the instrument, please check with the packing list to ensure that all items are included.

Before you plug in the recorder make sure that the voltage rating of the instrument matches the mains supply.

See that the correct fuses – as indicated below – are inserted into the fuse holders – 14 in Fig. 2.

for 115 V – – – 2 x 0,2 A slow
for 220/240 V – – – 2 x 0,1 A slow

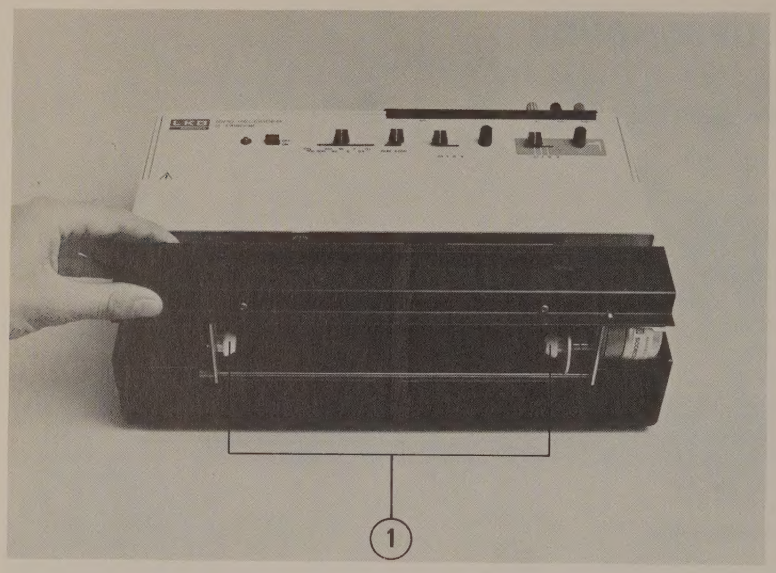


Fig. 3

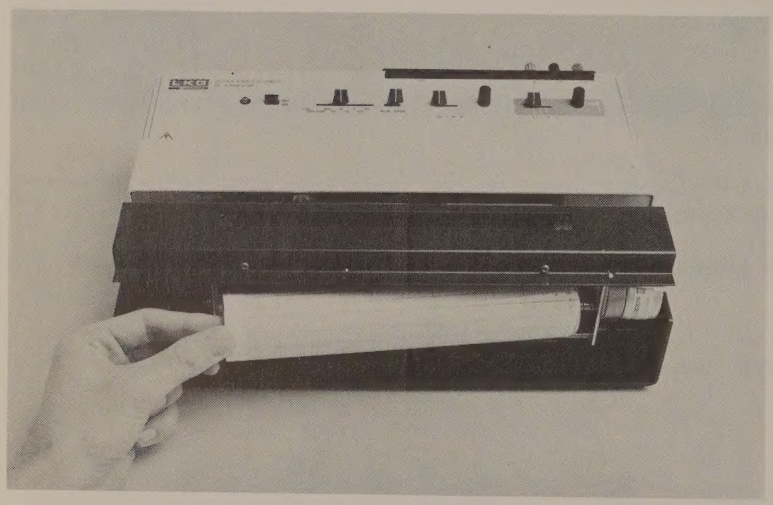


Fig. 4

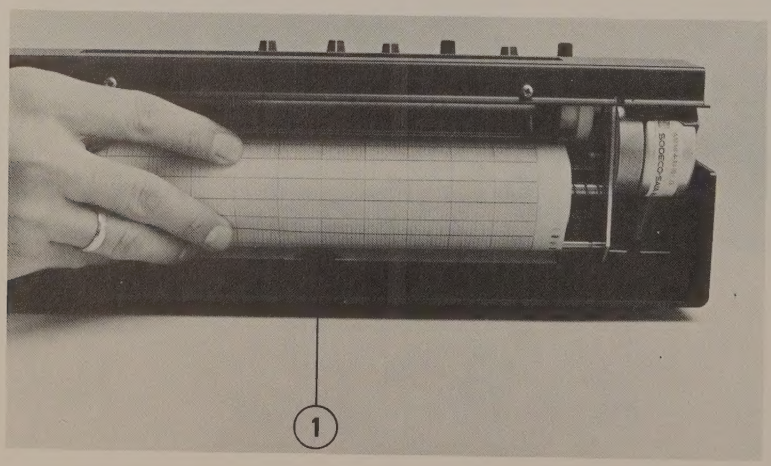


Fig. 5

Operation

Inserting the chart roll

Fig. 3 Turn the cassette (16 in Fig. 1) into its upper snap-in position.

Fig. 4 Two plastic guide cones (1 in Fig. 3) become visible. To load the cassette, the paper roll is pressed to the right against the spring-loaded cone until the chart roll can be pushed across the left cone.

N.B. The oval perforation must be positioned on the left hand side.

Fig. 5 Slide the end of the chart paper into the slit marked with an arrow (1) and push until the paper emerges at the writing area.

Fig. 6 & 7 Replace the paper cassette in the original position. Raise the paper guides (12 in Fig. 1). Pull the chart by hand until the chart drive sprockets are engaged in the perforations of the chart paper.
Push down the paper guides and unroll the paper with the manual chart drive (15 in Fig. 1). Make sure that the paper is correctly aligned with the recorder.

Servosystem

The recorders operate on a null-balancing potentiometric principle. The amplitude of the input signal is continuously compared with that of a calibrated voltage in the recorder. The amplified voltage difference between the input signal and the latter is used to activate a servo-motor which rotates until a null balance is achieved. The servo-motor is mechanically coupled to the recording pen and the actual position of the pen over the chart paper is therefore equivalent to and a measure of the amplitude of the input signal.

Automatic servo-motor cut-off

Should the pen travel be impeded or should the voltage exceed the selected range limits, the current supply to the servo-motor is cut off after a delay of 0.5 second. Hence, the servomechanism is never exposed to unnecessary wear.

When the pen travel is free or when the voltage reappears within range again, the operation of the servo-motor is immediately and automatically resumed.

Fig. 6

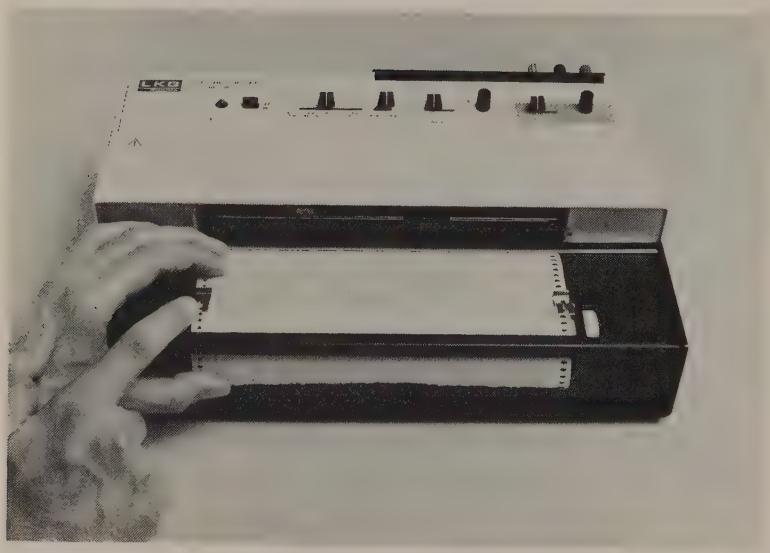


Fig. 7

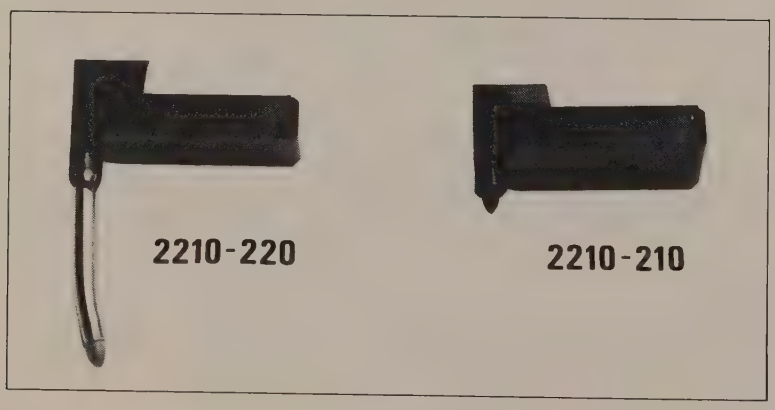


Fig. 8

Pens

The writing system is very simple and convenient with reliable fibre pens of the disposable cartridge type. The pens leave a very fine trace and do not 'bleed'.

After having removed the cap, the pen must be gently pushed into the penholder without any side pressure. When the recorder is not in use, remember to keep the tips of the fibre pens covered with the caps to prevent drying out of the ink. Pens are supplied in standard boxes, each comprising 6 pens.

Event marking (model 2210-061/062/071/072)

Event marking is performed as a displacement of the pen by approximately eight scale divisions to the right. The event marking signal must be a closure to ground, such as the event marking signal from the LKB 2112 RediRac, the LKB 2070 UltroRac II, the LKB 2111 MultiRac or the LKB 2211 SuperRac fraction collectors.

When using any of the above mentioned LKB fraction collectors, a connecting cable must be connected between the event marking socket on the fraction collector and the EXT-socket of the recorder – see Fig. 9 for selection of cable.

When used with the LKB 7000 UltroRac, the LKB 7000 UltroRac should be modified. Please call your local service engineer.

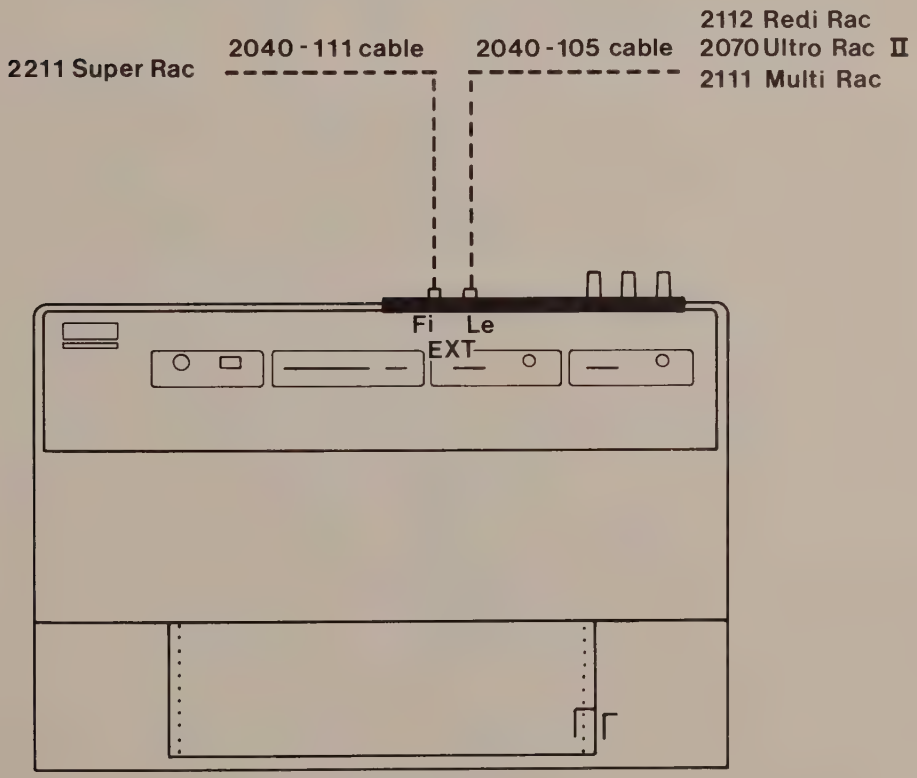


Fig. 9

Above shows which type of interface cables are needed for the different fraction collectors.

Paper chart drive

The paper chart drive is a stepper-motor which is operated either from the internal frequency generator or by an external TTL-level frequency. When operated by the internal frequency, paper speeds can be selected with a slide switch located on top of the instrument with the following speed ranges:

500 mm/min = 3000 cm/h	5 mm/min = 30 cm/h
100 mm/min = 600 cm/h	1 mm/min = 6 cm/h
50 mm/min = 300 cm/h	0.5 mm/min = 3 cm/h
10 mm/min = 60 cm/h	0.1 mm/min = 0.6 cm/h

Volume – axis

The LKB 2132 MicroPerpex (or 2120 VarioPerpex II) pump can be used as the external frequency source for the recorder. This being the case, the LKB 2132 MicroPerpex (or 2120 VarioPerpex II) pump must be connected to the LKB 2112 RediRac, LKB 2212 HeliRac, the LKB 2070 UltroRac, LKB 2211 MultiRac or LKB 2211 SuperRac with a connecting cable.

In this configuration, the frequency of the pump stepper motor, which is directly proportional to the volume of liquid pumped through the pump (regardless of changes in flow rate, viscosity etc.) will control the paper chart drive of the recorder. Hence, the X-axis of the recorder will represent a volume-axis.

It is therefore possible to compare chromatograms which were run at different flow rates and to obtain direct measures of void volumes, peak volumes and retention volumes.

Remote ON/OFF control of chart drive

This facility makes it possible to start or to stop the paper chart drive from an external instrument. This can be achieved with the RUN/STOP switch in position STOP.

The paper drive is activated by a TTL-low or common on the 'stop' pin in the EXT-socket and deactivated by a TTL-high or no connection on this pin.

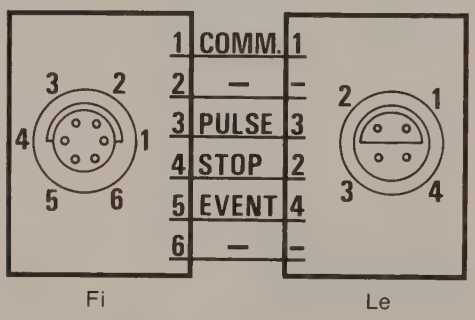


Fig.10 External control connectors.

Input signal

The input signal is connected to the terminals on the rear panel by banana plugs. The terminal marked 'low' must be connected to the side of the signal source which has the lowest impedance to ground (the other side of the source to 'High'). The terminal marked with the earth symbol can be used to ground the signal source ('Low') if it is not grounded elsewhere.

Zero check

A true electrical zero input to the amplifier can be obtained by switching to 0 V. The zero should be set to the right hand. For change of polarity see pages 15 and 16.

Zero adjustment

The zero is continuously adjustable between −50% of fsd to + 150% of fsd by turning the zero knob accordingly.

Calibrated input ranges

Models 2210-061/062/071/072 come with 2 calibrated ranges:
0.1 and 1 V

Each range is selected by switching the range selector – see 7 Fig. 1.

Recording

When all connections are made and the chart roll is inserted, the recorder is ready for use.

Prior to switching on the mains, the RUN/STOP selector (4 in Fig. 1) should be in the STOP position and the 0V should be selected on the measuring range selector (7 in Fig. 1). Also see 'Remote ON/OFF control' on previous page.

Switch on the mains and adjust the zero position of the pen by means of the zero knob (9 in Fig. 1).

Select the required measuring range.

The pen is lowered onto the chart paper with the pen lift lever (10 in Fig. 1).

Select a suitable chart speed and switch to RUN.

Technical specifications

Input range	2 fixed ranges per channel: 0.1 V and 1 V
Pen full scale deflection	200 mm
Inaccuracy	0.3% fsd max.
Non linearity	0.4% fsd max.
Pen response	0.5 s max. for 0-95% fsd
Input	floating, asymmetrical
Input impedance	1 Mohm fixed
Input current	500 nA max.
Input control	zero – x1 – x10
Normal mode rejection	65 dB min. 50 Hz.
Normal mode voltage	42 Vdc max., 30 Vac max; personnel safety limit
Common mode rejection	120 dB min., dc and 50Hz ac.
Common mode voltage	42 Vdc max., 30 Vac. max; personnel safety limit
Zero setting	–50% to + 150% fsd 10 turn
Zero drift	20 µV/°C max.
Polarity	right hand zero; A positive voltage on the red terminal gives a pen deflection to the left lefthand zero; internal setting
Chart drive	stepping motor
Chart speeds	500-100-50-10-5-1-0.5-0.1 mm/min.
Chart control	run – stop/extern
Chart length-life	25 m - 4100 hr/83 min (lowest speed/highest speed)

External control	Le	Fi	
	pin 1	pin 1	common d.c. isolated from channel 1 and channel 2 inputs common mode voltage: 42 V dc max. 30 V ac max.; personnel safety limit
		pin 2	not connected
	pin 3	pin 3	chartspeed: TTL, one step ≙ 0.05 mm; step rate 200 steps/s maximum; pulse width 2 m s minimum
	pin 2	pin 4	chart run/stop: TTL high/low, or switch
	pin 4	pin 5	event 1: TTL low or switch closed causes the lower pen to move 8 mm. to the right
		pin 6	not connected

Power supply	110/220 V; –10% +20%, 50/60 Hz
Power consumption	15 V.A.
Dimensions	366 x 236 x 108 mm
Weight	5.4 kg

Calibration of volume-axis

The signal frequency from the LKB 2132 MicroPerpex (or 2120 VarioPerpex II) peristaltic pump is proportional to the volume of liquid displaced by the pump.

The volume delivered per pulse is dependent upon:

a) the size of tubing used
b) the condition of the tubing
c) the pressure applied on the tubing

It is therefore necessary to calibrate the pump to determine the volume delivered in relation to the chart speed. Proceed as follows:

1) Set up the pump, recorder and fraction collector as indicated in Fig. 9.

2) Immerse one end of the tubing in a beaker filled with water

3) Connect the other end of the tubing to the tip of a 1ml graduated pipette.

4) Set the switch of the chart speed selector to 10 mm/min, STOP position.

5) Start the pump and watch the water rising in the tubing.

6) When the water level has reached the tip of the measuring pipette, make a mark on the chartpaper.

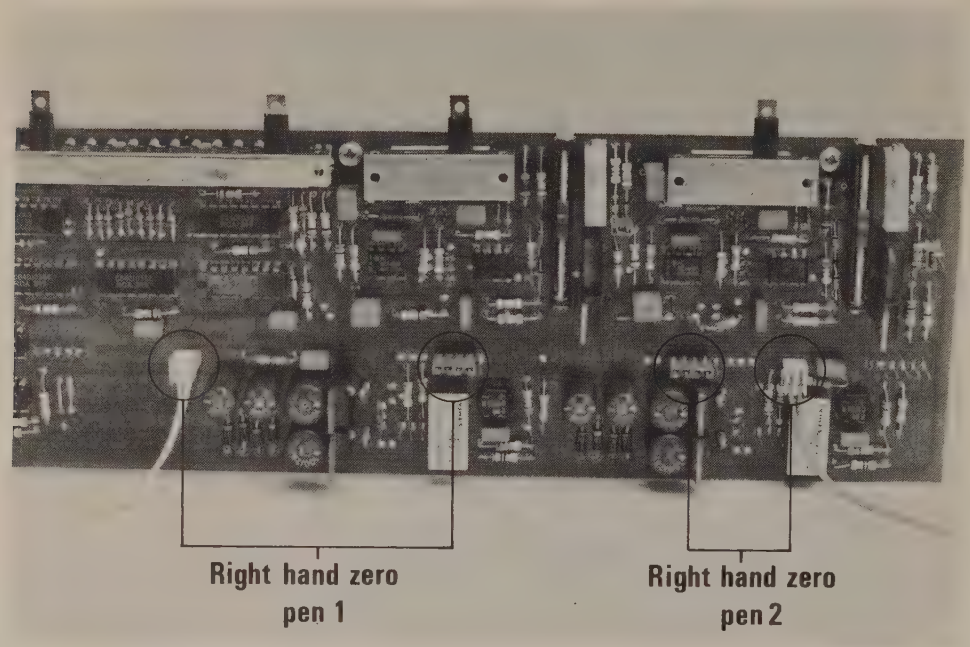
7) Bring the chart drive to a halt as soon as the water level hits the 1ml graduation mark.

8) Measure the chart length in cm and calculate the volume/cm as represented by the chart speed:

$$\frac{1}{\text{measured chart length}} \quad \frac{\text{ml}}{\text{cm}}$$

9) The calculated value is valid for the '10 mm/min' button of the chart selector. Other chart speeds can be obtained by means of the other push buttons. Accordingly, e.g. 0.1 mm/min will now correspond to:

$$\frac{0.1}{10} \quad \frac{\text{mm/min}}{\text{mm/min}} = 0.01 \text{ times the volume/cm chart speed previously calculated}$$


Right hand zero
pen 1
Right hand zero
pen 2

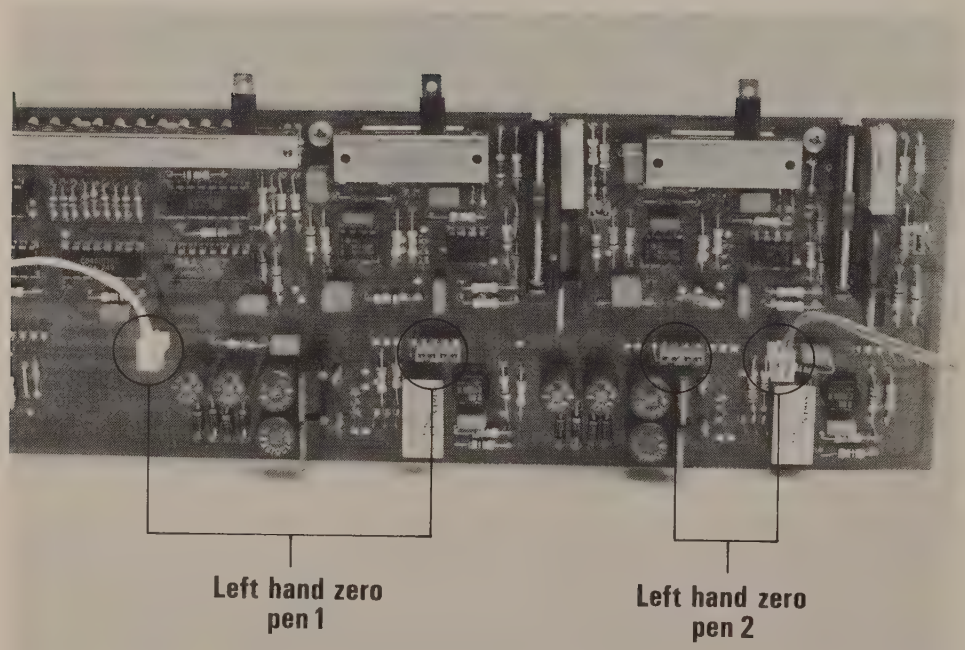

Left hand zero
pen 1
Left hand zero
pen 2

Fig. 11

Changing the polarity

LKB 2238 Uvicord SII, LKB 2158 Uvicord SD and LKB 2151 Variable Wavelength Monitor have a positive output. The LKB 2138 Uvicord S has the opposite polarity and consequently, for comparable results the polarity of the recorder should be changed.

For correct operation the following procedure should be followed, *but must be carried out by a LKB service engineer.*

1) Disconnect the mains cable

2) Remove the knobs on the top panel

3) Remove top panel by unscrewing the two screws

4) Remove the board with the range selectors on, by unscrewing the two fastening screws.

5) Unplug the cable to the paperfeed motor.

6) Locate the four (two for 1-channel versions) shortening straps on PC-board 1 and shift them according to Fig. 11.

7) Unplug the two (one for 1-channel versions) servo motor plugs and turn them.

   For zero right: blue lead on plug to the right (for channel two) or white lead on plug to the right (for channel one)

   For zero left: black lead on plug to the left.

8) Reassemble the recorder.

Accessories

LKB 2210-110 Standard chart paper, pack of 10 rolls, length 25 m each.

LKB 2210-210 Fibre tip pens of disposable cartridge type, pack of 6 short nib blue pens for single-channel recorder, for channel 1 of a two-channel recorder – see Fig. 8.

LKB 2210-220 Fibre tips pen of disposable cartridge type, pack of 6 long nib red pens for channel 2 of a two-channel recorder – see Fig. 8.

QUALITY STATUS REPORTS

Please fill in one of the Quality Status Reports and return to:

LKB-Produkter AB
Quality Control Dept.
Box 305
S-161 26 BROMMA
Sweden

IMPORTANT!
Any safety aspects or faults that can cause a hazardous situation shall be described in a written detailed report.

To: LKB-Produkter AB, Quality Control Dept., Box 305, S-161 26 Bromma, Sweden

Product No. ⌊_____⌋ Serial No. ⌊_____⌋ Date: Year | Month

Time from delivery to customer:

month	0	0–3	3–12	12–36
code	1	2	3	4

Warranty: ☐ yes

Check for appropriate failure code below

Sales company (representative)/serviceman: _____

Faulty components	0	Badly assembled or adjusted components	1	Missing components or accessories	2	Damage in transport		3
Spare part No.	Qty	Spare part No.	Qty	Spare part No.	Qty	Insufficient instructions for handling		4
						Incorrect handling		5
						Environmental influence		6
						SAFETY (report)		7
						Below specification		8
						Other fault		9

Cont. overleaf

To: LKB-Produkter AB, Quality Control Dept., Box 305, S-161 26 Bromma, Sweden

Product No. ⌊_____⌋ Serial No. ⌊_____⌋ Date: Year | Month

Time from delivery to customer:

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						Incorrect handling		5
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Faulty components	0	Badly assembled or adjusted components	1	Missing components or accessories	2	Damage in transport		3
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						Incorrect handling		5
						Environmental influence		6
						SAFETY (report)		7
						Below specification		8
						Other fault		9

Cont. overleaf

Fault description (Fault caused by and action to cure the fault):
Comments on serviceability (or usability):

Fault description (Fault caused by and action to cure the fault):
Comments on serviceability (or usability):

Fault description (Fault caused by and action to cure the fault):
Comments on serviceability (or usability):

THE INCENTIVE GROUP

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